

**PERCOM**

**DOUBLER<sup>TM</sup>**

**USERS MANUAL**

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**PERCOM DATA COMPANY  
211 N. KIRBY  
GARLAND, TEXAS 75042**



the DOUBLER(tm)  
Double-Density Disk Controller Adapter  
USERS MANUAL

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\*\*\* NOTICE \*\*\*

If the purchaser is unable or unwilling to follow the instructions for the installation of this equipment, return the sealed envelope containing the DOUBLER(tm) adapter within 10 days for a full refund. Units returned in which the seal has been broken will be charged a \$10.00 retest and restocking charge.

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\*\*\* NOTE \*\*\*

We have found that diskettes for which all tracks format and verify under the DBLDOS(tm) DOUBLE utility are suitable for double-density storage. This is not a totally foolproof check because of media aging and because disk drives sometimes become misaligned. If you do verify diskettes this way, however, they should be checked on all disk drives of the system.

You may also purchase diskettes which have been certified for double-density operation. At present, we stock diskettes certified for 35-track double-density storage (PN MD525-01) and for 40-track double-density data storage (PN MD540-01).

\*\*\* CAUTION \*\*\* CAUTION \*\*\* CAUTION \*\*\*

If you buy double-density certified diskettes from other suppliers, be sure the diskettes are certified for all tracks that you will be using, e.g., certified for 40 tracks if your disk system uses 40-track disk drives.



## II INSTALLATION

\*\*\* CAUTION \*\*\* CAUTION \*\*\* CAUTION \*\*\*  
Disassembly of your TRS-80\* computer may void the Radio Shack limited warranty, if the 90-day warranty period has not expired. You are urged to thoroughly check out your Expansion Interface, and exercise your warranty rights if necessary, before installing the DOUBLER(tm).

\*\*\* CAUTION \*\*\* CAUTION \*\*\* CAUTION \*\*\*  
Some types of integrated circuits are extremely sensitive to charge buildup on the leads. When handling components or circuit cards, as will be necessary to install the DOUBLER(tm) in the TRS-80\* computer Expansion Interface, the following precautions should be observed.

1. Wear clothes that do not create static charge.
2. Work in an area that is not carpeted.
3. Gather all materials, equipment and tools before starting the installation so that you will not have to leave the work area before the job is completed. For installation of the DOUBLER(tm), you will need: a medium Phillips-head screwdriver, a flat fingernail file or similar tool that may be used for prying, a bottle of nail polish, a DOUBLER(tm) circuit card and your Expansion Interface (EI).

### PROCEDURE:

1. Turn off power to your TRS-80\* computer.
2. Unplug the Expansion Interface ac power cords from the ac power source.
3. Disconnect all cables from the Expansion Interface.
4. Set the Expansion Interface on the work surface with the back toward you. The cables will exit on your left.
5. Remove the three Phillips-head screws from the Power Supply Compartment cover. This is the cover on top and to your left.
6. Lift out both power supply modules and place them on the work surface to the left of the Expansion Interface. Note. One power supply output cable will still be connected.
7. Turn the Expansion Interface over and orient it so that the power on/off switch is facing you. The TRS-80\* computer emblem should be to your left.
8. Remove the six screws holding the top and bottom of the Expansion Interface together. Note that there are three different screw lengths.
9. Remove the plastic bottom cover.

10. Locate the 40-pin, type 1771 disk controller chip. Refer to Figure 2.1.

\*\*\* NOTE \*\*\*

If you have previously installed a Percom SEPARATOR(tm) circuit card in your Expansion Interface, it may be removed and set aside since the DOUBLER(tm) adapter includes its own high-performance clock-data separator circuit. You will, however, need to remove the 1771 disk controller IC from the SEPARATOR(tm) for installation in the DOUBLER(tm) adapter.

11. Put a small dab of nail polish on top of the 1771 chip at the pin-1 end, i.e., the end with the groove.
12. Put a dab of nail polish on the Expansion Interface circuit board adjacent to the dab on the integrated circuit chip. Refer to Figure 2.1.

\*\*\* CAUTION \*\*\* CAUTION \*\*\* CAUTION \*\*\*

Read instructions #13 through #18 before proceeding. These steps involve removal and re-installation of the 1771 controller chip. If any of the pins of the 1771 chip are broken, the chip becomes worthless.

13. Carefully insert the nail file between the 1771 chip and its socket, and gently pry up a little. Refer to Figure 2.1.
14. Use the nail file to gently pry up the opposite end a little.
15. Repeat steps #13 and #14 until the chip lifts easily out of the socket.
16. Locate the 40-pin socket on the DOUBLER(tm) circuit card. Locate pin 1. Refer to Figure 2.1.
17. With the DOUBLER(tm) circuit card in one hand, position the 1771 chip in the socket -- being sure to get pin 1 of the chip positioned over the pin-1 contact of the socket -- and hold it in place with your thumb. Then, hold the DOUBLER(tm) card in both hands and, with both thumbs on top of the 1771 chip, press firmly. The chip should snap into place.  
Examine the chip for bent pins. If there are any bent pins, remove the chip as instructed in steps #13 through #15, straighten the pins and insert the chip again.
18. Plug the DOUBLER(tm) circuit card into the 1771 chip socket of your Expansion Interface. Note that the nail polish marks should be in the same relative position with the DOUBLER(tm) installed as they were when the disk controller chip was installed directly in the Expansion Interface circuit card.

\*\*\*CAUTION\*\*\*CAUTION\*\*\*CAUTION\*\*\*

Early model Expansion Interfaces, which have been modified to use the "Pregnant Cable," have twisted pair leads for RAS and CAS on the bottom side of the PC board. When inserting the DOUBLER, be careful not to pierce these leads.

The DOUBLER(tm) card is plugged in far enough if you can take the card by the edges and lift the Expansion Interface several inches off of the work surface.

\*\*\* NOTE \*\*\*

At this point, recheck everything that has been done so far. To proceed could be disastrous if a mistake has been made. Check that pin 1 of the 1771 chip, the DOUBLER(tm) 1771 socket and the Expansion Interface 1771 socket are all aligned.

19. Using the six screws removed in step #8, re-attach the bottom of the Expansion Interface to the top part. The longest two screws go in the holes nearest to you, the medium length set of screws go in the next pair of holes and the shortest screws go in the holes farthest from you. Do not over-tighten the screws.
20. Turn the Expansion Interface over to its upright position with the front facing away as before.
21. Set the power supply module which is still plugged into the Expansion Interface -- the Expansion Interface power supply -- inside the compartment. Set the other power supply inside the compartment.
22. Route the two ac power cords and the DIN cable from the second power supply out of the case, being sure to seat them in the cutouts provided in the edge of the case.
23. Replace the compartment cover. Be careful not to over-tighten any of the three screws.

This completes the installation of the DOUBLER(tm) adapter. The Expansion Interface may now be replaced in the system.

Check Out Procedure

After the Expansion Interface with the DOUBLER(tm) installed has been replaced in the system, check out the installation as follows:

1. Turn on the system and watch for any signs that suggest the DOUBLER(tm) is not installed correctly. If there are any, immediately turn the system off and thoroughly re-check the installation, beginning at step #2 above.
2. If there are no problems when power is applied, try to boot your TRSDOS\* or other single-density operating system. If the attempt fails, immediately shut the system down, and re-check the installation beginning at step #2 above.

If you succeed in booting your single-density disk operating system the DOUBLER is installed correctly.

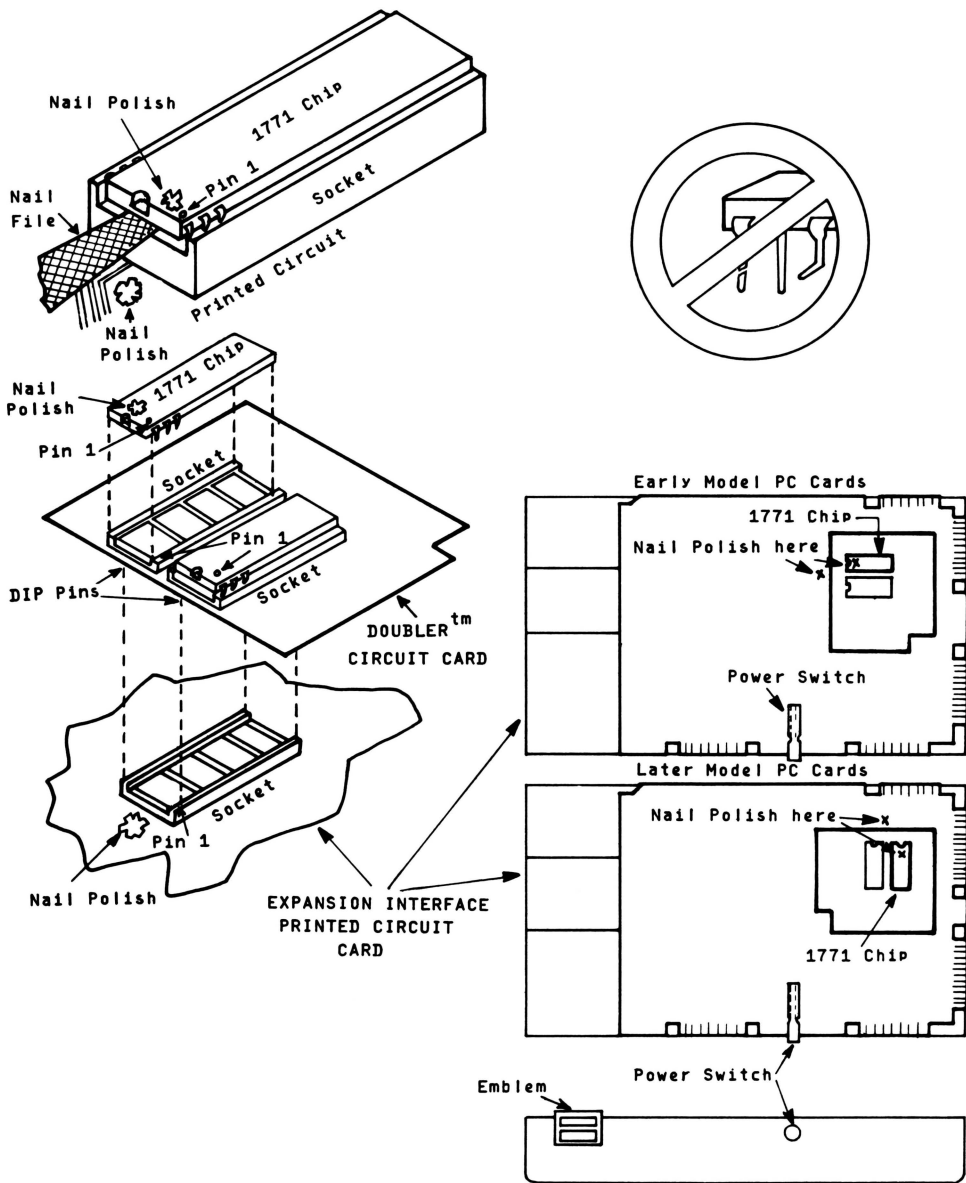


Figure 2.1



### III OPERATION

#### 3.1 INTRODUCTION

The Percom DOUBLER(tm) adapter works -- without any modifications to either software or hardware -- with TRSDOS\*, NEWDOS†, Percom OS-80(tm) and other single-density disk operating systems. Double-density operation, however, requires the use of a double-density disk operating system such as the Percom DBLDOS(tm).

The DBLDOS(tm) disk operating system provides the same commands, utilities and Level II BASIC enhancements as TRSDOS\*, and it is used in the same way as TRSDOS\*, with a few minor exceptions which are discussed in this Section.

Since DBLDOS(tm) is compatible with TRSDOS\* in almost all respects, the users manual for DBLDOS(tm) is the Radio Shack TRSDOS\*/Disk BASIC Reference Manual, Cat. No. 25-2104.

\*\*\* NOTE \*\*\*

THE PROCEDURES IN THIS MANUAL ASSUME THAT  
THE USER HAS A COPY OF THE TRSDOS\* MANUAL.

\*\*\* CAUTION \*\*\* CAUTION \*\*\* CAUTION \*\*\*

Before continuing with these procedures, get a blank disk and make a backup copy of the DBLDOS(tm) diskette. The procedure is described in paragraph 3.3.2.1.

#### 3.2 DBLDOS(tm) COMMANDS

All TRSDOS\* commands are available under DBLDOS(tm), and are used in exactly the same way, except as follows:

1. The COPY command has been enhanced.
2. The DEVICE command has been deleted.
3. The FORMAT and BACKUP commands have been replaced with a double-density utility called DOUBLE which includes both functions.

The DBLDOS(tm) operating system adds two enhancements to the COPY command:

1. DBLDOS(tm) supports the COPY operation using only one drive.
2. DBLDOS(tm) will copy:
  - a. single-density format to double-density format
  - b. double-density format to single-density format
  - c. single-density format to single-density format
  - d. double-density format to double-density format

### 3.2.1 COPY Command: Copying Using Two Drives

The COPY command format (syntax) for copying with two drives is the same as the format described in the TRSDOS\* Reference Manual, except a dollar sign (\$) is used immediately (no spaces) before the file name to indicate a single-density file. If a dollar sign is not used, double-density format is assumed.

When copying with two drives, if either file is in single-density format, the drive numbers where the files are to reside must be explicitly included in the file names, i.e., as part of the filespecs. Otherwise, the copying operation will abort.

In performing a two-drive file copy operation, one further precaution must be observed: a single-density file cannot reside in drive #0. If this is not possible, the one-drive copying procedure described in paragraph 3.2.2 may be used.

#### \*\*\* NOTE \*\*\*

In the following examples, the symbol  $\times$  represents a space, i.e., the space bar character.

Also, the names of files used in the examples -- SUPERZAP, TEST, COPY, etc. -- are used merely to illustrate procedure, and are not necessarily the names of extant files.

### EXAMPLE: Single Density to Double Density With Two Drives

1. Insert the DBLDOS system disk in drive 0 and boot DBLDOS (press the RESET button).
2. Insert the single-density disk with the file SUPERZAP in drive 1.
3. Type the following command line:

COPY~~x~~\$SUPERZAP:1~~x~~TO~~x~~SUPERZAP:0

4. Withdraw the system disk from drive 0, remove the write-protect tab (if one is in place) and re-insert the disk in drive 0.

#### \*\*\* NOTE \*\*\*

If the write-protect tab is not removed, the system will display the message WRITE PROTECTED DISKETTE, and then issue the DBLDOS prompt: DOS READY.

5. Press the ENTER key. The SUPERZAP file from the single-density disk in drive 1 will be copied as a double-density file on the disk in drive 0. When the copying function is completed, the system will display the message COPY COMPLETED and then issue the prompt: DOS READY.

6. Replace the DBLDOS(tm) system disk write-protect tab.

EXAMPLE: Double-Density to Single-Density With Two Drives

1. Insert a DBLDOS system disk, which includes the double-density file called MASTER, in drive 0, and boot in DBLDOS (press the RESET button).
2. Remove the write-protect tab from a formatted single-density diskette and insert it in drive 1.
3. Type and ENTER the following command line:

~~COPY~~MASTER:0~~X~~TO~~X~~1\$MASTER:1

The double-density file, called MASTER, on the system disk in drive 0 is copied to the single-density disk in drive 1. After the copying function is completed, the system will display the message COPY COMPLETED and issue the DBLDOS prompt: DOS READY.

EXAMPLE: Double-Density to Double-Density With Two Drives

1. Insert a DBLDOS system disk, which includes the file called TEST, in drive 0, and boot in DBLDOS (press the RESET button).
2. Remove the write-protect tab from a double-density formatted disk and insert the disk in drive 1.
3. Type and ENTER the following command line:

~~COPY~~TEST:0~~X~~TO~~X~~1\$TEST:1

The copying function will execute, the system will display the message COPY COMPLETED and then will issue the DBLDOS prompt: DOS READY.

Single-density to single-density copying may be performed on either a three-drive or a one-drive system. For a three-drive system, insert the DBLDOS system disk in drive 0 and use drives 1 and 2 for source and destination drives. Remember to prefix the file names with dollar signs, and include drive numbers explicitly in the filespecs. The copying procedure for one-drive systems is explained below.

3.2.2 COPY Command: Copying Using One Drive

The COPY command format for copying a file from one diskette to another using only one drive is as follows:

`COPY/:D/filespec1/TO/filespec2`

where D is the drive number, and D = 0, 1, 2 or 3. (The ~~/~~ symbol represents a space, i.e., the space bar character.) If either file is in single-density format, the file name (filespec) must be preceded by a dollar sign symbol. Otherwise, double-density files are assumed. See examples below.

\*\*\* CAUTION \*\*\* CAUTION \*\*\* CAUTION \*\*\*

In performing a file copying operation using only one drive, the prompts must be followed exactly since the COPY routine cannot distinguish between a source and destination diskette.

EXAMPLE: Single-Density to Double-Density With One Drive

1. Insert the DBLDOS system disk in drive 0 and boot in DBLDOS (press the RESET button).
2. Type and ENTER the following command line:

`COPY/:0/$NAME1/TO/NAME2`

3. Insert the disk containing the single-density file, NAME1, in drive 0 as directed by the displayed message. Hit ENTER.
4. Remove the write-protect tab from a formatted double-density diskette and insert the diskette in drive 0. Hit ENTER.

This copying procedure copies a file called NAME1 on a single-density diskette to a file called NAME2 on a double-density diskette using drive 0 only. When the function is completed, the system will display the message:

COPY COMPLETED  
MOUNT DBLDOS DISK ON DRIVE 0 AND PUSH ENTER

Complying with the instruction will cause the system to issue the DBLDOS prompt: DOS READY.

EXAMPLE: Double-Density to Single-Density With One Drive

1. Insert the DBLDOS system disk in drive 0 and boot in DBLDOS (press the RESET button).
2. Type and ENTER the following command line:

`COPY/:0/DOUBLE/BAS/TO/$SINGLE/BAS`

3. Insert the disk containing the double-density file DOUBLE/BAS in

drive 0, as directed by the displayed message.

4. Remove the write-protect tab from a formatted single-density receiving disk and insert the disk in drive 0. Hit ENTER.

This procedure copies the double-density file DOUBLE/BAS onto a single-density diskette under the name SINGLE/BAS. When the function is completed, the system displays the message:

COPY COMPLETED  
MOUNT DBLDOS DISK ON DRIVE 0 AND PUSH ENTER

Complying with the instruction causes the system to issue the DBLDOS prompt: DOS READY.

#### EXAMPLE: Single-Density to Single-Density With One Drive

1. Insert the DBLDOS system disk in drive 0 and boot DBLDOS.
2. Type and ENTER the following command line:

~~COPY:0/\$CHESS/TO/\$CHESS~~

The procedure from this point is the same as for the two previous examples. Simply comply with the displayed messages to complete the copying operation.

Copying a double-density file to a formatted double-density diskette proceeds in exactly the same way as for single-density to single-density copying, except file names are not prefaced with a dollar sign.

#### \*\*\* NOTE \*\*\*

The COPY command is the only means by which data or programs may be moved from a single-density diskette to a double-density diskette and vice versa.

#### 3.2.3 The DEVICE Command

The TRSDOS\* DEVICE command is not available under DBLDOS(tm).

#### 3.3 DBLDOS(tm) UTILITIES

The FORMAT and BACKUP utilities of TRSDOS\* have been replaced by a double-density utility called DOUBLE. This utility must be used to format and back up double-density diskettes.

### 3.3.1 The DOUBLE Utility: FORMAT Command

\*\*\* CAUTION \*\*\* CAUTION \*\*\* CAUTION \*\*\*  
The DOUBLE utility does not test to see if the diskette to be formatted is blank. The user must determine that a diskette is blank to avoid formatting over data or programs.

The command syntax for formatting a double-density diskette is as follows:

~~DOUBLE~~/~~FORMAT~~:N

where N is the drive number (0 - 3).

When the command is entered, the system will first display header information, and then issue prompts as follows:

1. DISK NAME? (may be up to eight characters)
2. CREATION DATE? (Type MM/DD/YY)
3. HOW MANY TRACKS? (Enter 18 through 80. Defaults to 40.)

The number of tracks entered becomes a part of the diskette, and the system will never try to use more tracks on the diskette than the number entered.

The DBLDOS(tm) operating system accommodates any mix of diskettes having track counts from 18 to 80.

\*\*\* NOTE \*\*\*

Percom supplies a software patch called PATCHPAK(tm) with Percom drives. This patch upgrades TRSDOS\* for 40- and 77-track operation. It is not necessary to use PATCHPAK(tm) if diskettes are formatted with the DBLDOS(tm) DOUBLE utility.

\*\*\* NOTE \*\*\*

DBLDOS(tm) is supplied on a 35-track system minidiskette that may be used to make 35-, 40- or 77-track system backup disks. An optional 77-track system disk is available for users with only 77-track drives.

After the formatting operation is completed, all sectors of the diskette are checked and verified. As the formatted diskette is being verified, each flawed sector is recorded in a table which becomes a permanent part of the diskette. This table has a capacity of five entries. If more than five sectors are flawed, the utility will display the following message:

TOO MANY FLAWS, USE ANOTHER DISK!

A diskette with more than five flaws should be considered unusable for double-density operation.

\*\*\* NOTE \*\*\*

As explained under "System Requirements" in the INTRODUCTION section, not all types of diskettes are suitable for double-density data storage. Before attempting to format a diskette, we urge you to review these diskette requirements.

During DOUBLE BACKUP, each time a flaw is discovered on the source disk the flaw table is searched to see if that particular sector had a flaw at format time. If found, the error is displayed on the screen, but the BACKUP continues. An error on a sector which is not in the flaw table will cause BACKUP to request whether to (C)ONTINUE, (R)ETRY or (A)BORT the backup operation.

\*\*\* NOTE \*\*\*

The 'C' option will assume a good read, and write the data to disk. It is probable that the data written will not be the same as the data originally recorded on the source disk.

Any flaws on the source diskette will be propagated to the destination disk even though it is not flawed. This is a consequence of the "mirror image" nature of DOUBLE BACKUP. Any error on the destination diskette will be considered fatal and cause the backup to be aborted.

When the FORMAT utility finishes its task, the system returns to the DBLDOS(tm) program. If formatting is done in drive #0, the system will request that the DBLDOS(tm) disk be replaced before it attempts to return to the operating system.

### 3.3.2 The DOUBLE Utility: BACKUP Command

The syntax for the DOUBLE BACKUP utility is as follows:

~~DOUBLE~~BACKUP~~/S~~~~/D~~

where S represents the number of the source drive and D represents the number of the destination drive. S, D = 0, 1, 2 or 3.

The BACKUP utility requires no user supplied information. After the user responds to the prompts to load source and destination disks -- assuming the backup is performed using two drives -- the utility will format the destination diskette.

\*\*\* CAUTION \*\*\* CAUTION \*\*\* CAUTION \*\*\*  
The DOUBLE BACKUP utility does not verify that the destination diskette is a blank disk. It will write over the disk in the destination drive and destroy any previously written files.

\*\*\* NOTE \*\*\*

If the backup operation is performed using diskettes that have different track counts, the destination diskette must have the higher track count.

If a backup diskette is made using only one drive, the utility will request that the source drive be loaded. Next, it will read the source to determine the number of tracks on the diskette. Then it will prompt for the destination drive and format the destination diskette for the number of tracks on the source diskette. Once the destination diskette is formatted, the system will enter a cycle whereupon the utility will prompt for the source diskette, read as much of the data as can be stored in memory and then prompt for the destination. After the data is written out and verified, the system will read the source diskette again for remaining data and repeat the write and verification steps. This cycle is repeated until the entire diskette is backed up.

Again, the user must be sure that the destination diskette is blank to avoid formatting over a file or program disk.

\*\*\* NOTE \*\*\*

Both the FORMAT and BACKUP utilities work totally in double density. Neither may be used for single-density files.

### 3.3.2.1 Making a Backup of the DBLDOS(tm) Diskette

Using a blank diskette, make a backup of the DBLDOS(tm) diskette as follows:

1. Insert the DBLDOS(tm) system diskette in drive #0 and push RESET. The system will display a banner, copyright information and the message DOS READY, indicating it has "come up" in DBLDOS(tm).
- 2a. For a multiple-drive system, type and ENTER the following command line:

~~DOUBLE~~~~BACKUP~~:0~~TOP~~:1

The system will display the message:

MOUNT SOURCE DISK IN DRIVE 0 AND PUSH "ENTER"

Since in this case the source disk is the DBLDOS system disk, merely push the ENTER key.



Respond to the displayed instruction to mount a destination disk in drive 1 by inserting a blank diskette, with the write-protect tab removed, in drive 1. Hit ENTER.

Pushing the ENTER key causes the backup function to be performed.

- 2b. For a single-drive system, type and ENTER the following command line:

~~DOUBLE~~~~BACKUP~~~~:0~~~~TOP~~:0

The system will alternately prompt for insertion of the source disk (DBLDOS(tm) system disk) and destination disk (blank diskette with the write-protect tab removed) in drive 0 until the DBLDOS(tm) program has been completely copied.

\*\*\* NOTE \*\*\*

Depending on the amount of system RAM, the diskettes may have to be exchanged a dozen or more times when backing up with a single-disk system.

3. Store the original DBLDOS(tm) diskette in a safe place.
4. Insert the new DBLDOS system disk in drive 0 and boot DBLDOS (press the RESET button). Type and ENTER the command FREE and the system will display the number of granules on the disk that are still available for data or program storage.

### 3.3.2.2 Expanding the Capacity of the System Disk

Unlike TRSDOS\*, DBLDOS is able to handle any combination of mini-disk drives having varying numbers of tracks. To do this DBLDOS assumes that every drive has the capacity for up to 80 tracks. When a diskette is formatted (using the DOUBLE FORMAT command) the number of tracks on the diskette is recorded in its Granule Allocation Table (GAT). This information tells DBLDOS how many tracks are available for data storage on that diskette.

The standard DBLDOS system diskette provided with the DOUBLER(tm) is formatted for 35 tracks, so as to be compatible with nearly all existing disk drives. (An optional 77-track DBLDOS system diskette is available as an alternative diskette for 77-track Percom TFD-200(tm) drives.) If your system disk drive (drive 0) has a

35-track capacity no further action is necessary. If, however, your system drive has more than a 35-track capacity and you wish to store additional information on the system diskette, it may be expanded using the DOUBLE BACKUP command. The format for this command is as follows:

~~DOUBLE~~~~BACKUP~~~~:~~~~S~~~~:~~~~D~~~~T~~~~#~~

The source drive is represented by 'S', and the destination by 'D'. The track capacity of the destination drive is specified by 'T#', where '#' represents a two-digit decimal number. Note that it is not possible to specify a destination disk which is smaller than the source disk.

When the destination track capacity is specified during a DOUBLE BACKUP the range of sectors copied is still limited by the size of the source diskette. The destination, however, is formatted for the larger size, and the Granule Allocation Table (GAT) is enlarged by the number of additional granules offered by the extra tracks.

#### EXAMPLES:

~~DOUBLE~~~~BACKUP~~~~:~~~~0~~~~:~~~~1~~~~T~~~~40~~ Creates a 40-track DBLDOS

~~DOUBLE~~~~BACKUP~~~~:~~~~0~~~~:~~~~1~~~~T~~~~77~~ Creates a 77-track DBLDOS

~~DOUBLE~~~~BACKUP~~~~:~~~~0~~~~:~~~~1~~ Creates a 35-track DBLDOS.

### 3.4 DBLDOS(tm) BASIC

DBLDOS(tm) BASIC works the same as Radio Shack Disk BASIC except that the number-of-files and memory-size parameters are typed on the BASIC command line instead of being entered in response to a prompt.

Also, in DBLDOS(tm) BASIC it is possible to enter a BASIC command on the BASIC command line that will be executed when BASIC becomes ready.

These differences are illustrated by the following examples.

#### EXAMPLE:

~~BASIC~~~~5,32457,RUN~~"MENU"

This command, when ENTERed, will load BASIC, set the number of files to five, set the memory size to 32,457 bytes and load and run a program called MENU.

#### EXAMPLE:

~~BASIC~~~~RUN~~"TEST"

This command, when ENTERed, will set the number of files to the default

value (=3), set the memory size for the default value of all available memory and load and run a program called TEST.

The general format for DBLDOS(tm) BASIC commands is as follows:

BASIC~~/~~F,M,{COMMAND}

where F = the file size, M = the memory size (16,384 bytes to 48 Kbytes) and {COMMAND} represents any valid BASIC command. All parameters, i.e., everything after BASIC, is optional.

#### 3.4.1 Changing Drive Step Time

Some drives are capable of stepping, i.e., moving the head from track to track, faster than the 40-millisecond rate set in the DBLDOS system diskette. If all of the drives in your system are capable of a faster step rate, DBLDOS may be patched to step at the faster rate.

A PATCH program, written in BASIC, is included on the DBLDOS system diskette. Patch files are also provided containing the necessary patches for various step times. To change the step time of your DBLDOS system disk, boot DBLDOS and then proceed as follows:

1. Remove the write-protect tab and load the DBLDOS disk to be patched in drive 0. Do not use your original DBLDOS minidiskette.
2. Type and ENTER the following command line:

BASIC~~/~~LOAD~~/~~"PATCH/BAS"

This will load DBLDOS Disk BASIC and the PATCH utility.

3. At the READY prompt, type and ENTER:

MERGE~~/~~"STEPXX/PAT"

using one of the following:

"STEP30/PAT" -- for 30 ms step time (standard)  
Use for Percom TFD-200(tm), Shugart and Micropolis drives.

"STEP20/PAT" -- for 20 ms step time  
Use for Percom TFD-100(tm), Siemens (or Wangco or Perkin-Elmer) and Pertec drives.

"STEP12/PAT" -- for 12 ms step time  
Not normally used.

"STEP06/PAT" -- for 6 ms step time  
Use for Percom TFD-40(tm), MPI and Tandon drives.

4. When the READY prompt appears again, type and ENTER the command RUN.
5. Replace the DBLDOS system disk write-protect tab.

After performing the above steps, the diskette in drive 0 will be permanently configured for the faster step time. These changes will not be operational, however, until the system has been re-booted by pushing the RESET button. The above procedure may be repeated as desired whenever a change in step time is necessary.

## Appendix A1 DBLDOS(tm) OPTIONAL PATCHES

As explained in the INTRODUCTION Section, some non-Tandy programs will not work under DBLDOS(tm). In general, a program which does its own disk I/O outside of the DOS will not work under DBLDOS(tm). Also, some programs supported by DBLDOS(tm) require minor "patching" to operate properly. This appendix includes optional patches for several popular programs supported by DBLDOS(tm), and a short list of programs known to be incompatible with DBLDOS(tm). We will continue to provide patches for other popular programs, and to keep the list of incompatible programs current. If you have a program from a non-Tandy supplier that works with TRSDOS\* but will not work with DBLDOS(tm), contact the program supplier for information on how to modify the program for DBLDOS(tm) compatibility.

### PATCH APPLICATION PROCEDURE

Note: Detail procedures are covered in Section III of the manual.

Boot up DBLDOS(tm) and load BASIC. When BASIC has responded with the 'READY' prompt, enter the following command line:

LOAD "PATCH/BAS"

When the PATCH program has been loaded enter the patch lines set forth below, using the command 'AUTO 1000'. Work slowly and carefully to avoid making mistakes. After all patch lines have been entered into the PATCH program, type and enter 'RUN'. The program will respond with a banner and a display indicating that it is in Phase 1.

Patches are applied in two phases. During Phase 1 each patch is validated to see if it was entered correctly. Each patch consists of two or more DATA statements. The first DATA statement for each patch contains the file name (in quotes) followed by a comma and the number of actual patch lines which follow. Errors are reported by referencing the file name and the line number (relative to the first DATA statement in the patch) which is in error. For example an error in line 3 of DOUBLE/CMD would refer to the third DATA statement after the DATA statement which contains "DOUBLE/CMD".

After all patch lines have been found to be valid, Phase 2 is entered. At this time the patches are actually applied. Be sure the disk being patched (usually in drive 0) is not write-protected. Do not interrupt the patching process once Phase 2 has been entered, as a partially patched program probably will not work correctly.

PATCH LINES:

Patches to Michael Shroyer's the Electric Pencil.

```
1000 DATA "PENCIL/CMD",1
1010 DATA 1,175,3,0,0,0,179
1020 DATA "*END"
```

Patches for Radio Shack's SCRIPSIT/LC and SCRIPSIT/UC.

Be sure to patch BOTH programs.

```
1000 DATA "SCRIPSIT/UC",4 (or SCRIPSIT/LC)
1010 DATA 12,119,3,58,185,124,501
1020 DATA 12,252,4,50,182,124,196,820
1030 DATA 13,0,3,239,93,0,348
1040 DATA 20,228,1,118,367
1050 DATA "*END"
```

Patches for the MISOSYS DISK\*MOD EDTASM.

(The following patch may not apply to all versions.)

```
1000 DATA "EDTASM/CMD",1
1010 DATA 8,215,8,0,0,0,0,0,62,17,0,310
1020 DATA "*END"
```

Patches for Microsoft's EDIT command.

```
1000 DATA "EDIT/CMD",3
1010 DATA 33,163,6,214,1,48,8,24,4,501
1020 DATA 39,233,8,96,105,214,1,48,1,43,41,829
1030 DATA 39,241,6,7,48,1,35,24,4,405
1040 DATA "*END"
```

Patch for Radio Shack PROFILE (1.0)

These patches increase the "PRODAT" file  
from 32 grans to 51 grans.

```
1000 DATA "INIT",1
1010 DATA 4,134,1,254,393
1020 DATA "*END"
```

NOTES ON THE MICROSOFT BASIC COMPILER

The Microsoft BASIC compiler needs no patching to operate under DBLDOS(tm). It does, however, have an inconsistency which must be mentioned. Both the compiler (BASCOS/CMD) and the Linkage Editor (L80/CMD) modify the BREAK key vector within DBLDOS(tm) so that it may be used to exit back to DBLDOS(tm). Unfortunately the vector is not restored

and is left pointing to the memory formerly occupied by BASCOM or L80. For this reason one should not use the BREAK key after re-entering DBLDOS(tm) from either BASCOM or L80 until the command 'DEBUG (OFF)' has been entered. Hopefully this problem will be corrected by Microsoft in the next release of the BASIC compiler.

One final point. DBLDOS(tm) uses the same end-of-file convention as NEWDOS. Therefore, the EOF mark generated by the Microsoft compiler will be detected one sector earlier than with TRSDOS. One possible solution is to maintain your own EOF in software and write enough dummy data at the end of a file to fill an additional sector. We cannot suggest a patch for the compiler because the compiler injects the EOF subroutine into the compiled code at a different location for each compiled program.

#### PROGRAMS NOT SUPPORTED UNDER DBLDOS(tm)

The following programs will not run under DBLDOS(tm) and cannot be conveniently patched to do so. This list is subject to revision as more such programs become known.

<u>Program Name</u>	<u>Comment</u>
---------------------	----------------

Z80ZAP/CMD	Will not work.
SUPERZAP/CMD	Although this NEWDOS/80 machine language version will not work, Version 3.0, written in BASIC, works well.
RSM2D	Works except for disk commands.





Appendix A2  
DOUBLER (tm) STATUS REPORT

The Percom Double-Density Adapter for the TRS-80\* Model I computer is one of the most successful products created by Percom. Many thousands are already in use world-wide. We would like to tell you just how many but the competition is listening! The present production rate is about 1,000 DOUBLERS per month and increasing.

One of our major problems is keeping up with the increasing demand. Our technical staff has been very busy handling customer questions. If you feel our response to your questions is sometimes slow, please bear with us, we are not ignoring you. This is one of the penalties of an overwhelmingly popular product.

The purpose of this report is to provide some insight into the operation of the DOUBLER and to answer frequently-asked questions. By necessity, some of the discussion is slightly technical.

Improvements to the DOUBLER

"You can't learn to swim unless you get in the water."

Percom is currently producing the fourth version of the DOUBLER. Each improvement solved a recurring customer or manufacturing problem.

DOUBLER version 1 used an analog phase-locked loop for data separation that had to be abandoned because the circuit is sensitive to component aging and Expansion Interface power supply voltage variations.

Later a few customers reported difficulties when operating single-density but no problems when operating double-density. Responding to these reports, we discovered that some 1771 disk controller integrated circuits (ICs) that Tandy installs in the Expansion Interface have excessive current leakage between the +12-volt circuit and the Write Data (WD) circuit, causing the logic-one level of the 1771 Write Data line to rise above six volts! This excessive voltage caused a gate input breakdown in the DOUBLER circuit that connects to the WD line. The problem was solved in most cases by loading the 1771 WD line with a 4.7k resistor to ground. In extreme cases it may be necessary to replace the 1771 -- from a reputable supplier. (If you didn't know, some large and well-known manufacturers have a reputation for purchasing and using components which are referred to in the industry as "floor sweepings". These are components which do not fully meet the component manufacturer's published specifications but which may function adequately in a specific application.)

Most customers have experienced no problems with the DOUBLER. A few customers, however, have reported consistent errors on high-numbered tracks. Most of these problems were resolved by using either higher quality or selected diskettes. Others required some amount of disk drive realignment or assymetry adjustment.

Even though we were able to solve nearly all of the reported problems, we felt it necessary to improve the performance of the double-density data separator to provide greater tolerance to diskette and disk drive

variations. The result of this refinement is the DOUBLER II.

Improvement would have been easy if we could have used an analog phase-locked data separator. However, our experience with such a circuit in an earlier version of the DOUBLER convinced us that an analog phase-locked loop (PLL) could not be adjusted to function reliably in all TRS-80\* Expansion Interfaces because the EI power supply voltage variation was too great.

The DOUBLER II uses a Read-Only Memory (ROM) programmed digital phase-locked loop data separator. In this data separation application, the digital circuit is superior to an analog PLL because it is immune to Expansion Interface power supply voltage variations, component aging and "no-signal" VCO drift, all of which degrade the performance of conventional analog PLL data separators. PLL tracking is programmed by a bipolar ROM that is driven by a 16-MHz oscillator. This permits less phase jitter and finer pulse resolution than obtainable from analog PLLs with equivalent capture and tracking characteristics.

#### Answers to Most Often Asked Questions

Question: Why does the DOUBLER use both a 1771 and 1791 disk controller IC?

Answer: Each block or sector of data stored on a soft-sectored diskette contains a special identifying code called a Data Mark. The 1771 disk controller can create four different Data Mark codes while the 1791 can create only two of the Data Mark codes in its single-density mode. Model I TRSDOS\* and many of the TRSDOS-like operating systems write the Directory sectors with one of the Data Mark codes that cannot be generated with the 1791. Consequently, to insure total compatibility with existing single-density software, Percom elected to use the 1771 disk controller for all single-density operations and to use the 1791 disk controller only for double-density operation. Mode selection is software controlled. The single-density mode is automatically selected at "power-on" and whenever the computer is reset to permit the DOS to "boot in" single density.

Question: Why doesn't DBLDOS(tm) ...?

Answer: DBLDOS is the double-density disk operating system supplied with the Percom DOUBLER. It was developed in accordance with one very specific directive:

"Keep it as simple and as much like TRSDOS\* as possible."

This meant minimal relearning for those users already familiar with TRSDOS\*. Many "bells and whistles" could have been implemented in DBLDOS but we felt these would have compromised our development objective.

Instead, Percom supported development of DOUBLEZAP patches written by Jim Stutsman, which permitted the more comprehensive NEWDOS/80†, LDOS††,

possible, we felt it necessary to retain the five-sector per granule structure. However, 18 sectors per track does not evenly divide by five sectors per gran. To solve this dilemma, the software designer cleverly created a system of pseudo tracks, each containing 15 sectors. An algorithm converts a pseudo track/sector to a real track/sector at the time the sector is read or written. For example: pseudo track #2 sector #5 will be located on real track #1 sector #7. This process is normally invisible to the user. However, if you attempt to access the disk at the sector level (for example, with SuperZap) you may find the content of the sectors to be different than expected.

Question: What about the competition?

Answer: At least one other manufacturer is now advertising a double-density adapter for the Model I TRS-80 computer. (Competition keeps us on our toes!) And at least one other company attempted and failed to make a double-density adapter for the Model I TRS-80 computer, before Percom succeeded by using innovative hardware and software. All of the competing double-density adapters we have examined appear to be copies of early model DOUBLERS. One such adapter is a design which Percom field tested and abandoned over one year ago! Percom has the design and manufacturing experience of several thousand double-density adapters. We have identified and solved double-density problems which our competitors have not yet discovered. DOUBLER II is evidence of Percom's commitment to continued product improvement.

Question: How compatible is TRS-80 Model I and Model III software?

Answer: Now that the TRS-80 Model I computer is no longer generally available, many TRS-80 computer users are switching to the newer Model III only to discover diskette software that ran on the Model I will neither load into nor run on the Model III.

If you are familiar with the Model III disk system, you are probably familiar with the CONVERT utility which permits Model I TRSDOS diskettes to be read by the Model III and converted to Model III compatible diskettes. While this is a possible solution, we feel most users are looking for more direct compatibility, a system which permits a Model I diskette to be inserted in a Model III and used immediately without any conversion. After all, if a diskette can be read by a Model III with a conversion utility, why can't it be used directly by the Model III TRSDOS?

The answer lies in the difference between the hardware and software of the Model I and Model III.

#### Hardware Differences:

Small computers are frequently described by the arrangement and utilization of their "memory maps". The Z-80 microprocessor used in TRS-80 computers has two such "maps"; the standard memory map and a smaller I/O map. The I/O map was designed for connection and

communication with the various I/O devices which may be required in a computing system. In the Model I computer, the I/O map is virtually unused. Instead, a portion of the standard memory space is set aside to control the keyboard, video display, disk and printer. Only the cassette and RS-232 interface function via the I/O map. In the Model III computer, the keyboard and video display are controlled by the same portion of the standard memory space as in the Model I. However, to make room for the larger ROM used in the Model III computer, the disk controller and printer interfaces were transferred to the I/O map. In addition, the disk controller was converted to double density for greater disk storage capacity.

#### Software Differences:

These hardware changes necessitated some changes in the disk operating system:

1. The disk controller is accessed via I/O instructions rather than memory reference instructions.
2. Double-density operation packs more sectors per track than single density (18 vs 10), suggesting a different number of sectors per granule (3 or 6 vs 5).
3. Tandy chose to implement a disk operating system for the Model III which is more like the Model II TRSDOS than the Model I.

#### Single-Density Compatibility:

Assume you wish to insert a Model I TRSDOS-compatible diskette into a Model III system. Further, assume you wish to read some of the files on the disk, make changes to the files, and/or add new files. This would be easy if the Model III created single-density files that could be read by the Model I. Although the Model III disk controller is capable of single-density operation, the Model III cannot write directory sectors with the Sector Identifying Code (Data Mark) required by Model I TRSDOS. Consequently, the Model III is limited to reading Model I TRSDOS diskettes. It cannot modify or add new files to the diskette because it cannot update the directory sectors in a manner acceptable to Model I TRSDOS. Since this is a characteristic of the Model III disk controller hardware, it cannot be overcome by modifying the Model III disk operating system.

On the other hand, if you use a Model I disk operating system that does not use the special sector Data Marks required by Model I TRSDOS, it is technically possible to create a disk operating system for the Model III which will read and write Model I compatible diskettes. Percom's OS-80 (formerly MICRODOS) disk operating system is such an operating system. It will be described in more detail later.

#### Double-Density Compatibility:

Since the TRS-80 Model I was not designed for double-density operation, it is incapable of reading the double-density diskettes created by the Model

III unless the Model I Expansion Interface is modified for double-density operation with the Percom DOUBLER.

Although we must still consider the differing hardware-imposed software requirements for the Model I and Model III disk operating systems, a DOUBLER-equipped Model I computer appears to be the best avenue for compatibility between the Model I and Model III disk computing systems.

At this time, only the Percom OS-80 operating system offers fully-compatible interchangeability of Model I and Model III diskettes. It should be possible to load and run any single- or double-density file supported by OS-80 on either the Model I or Model III computer. Of course, you must "boot" the appropriate version of OS-80 into each computer. Versions of OS-80 are available for both the Model I and Model III.

If your program runs under TRSDOS or one of the TRSDOS-like operating systems (NEWDOS, LDOS, VTOS, DOSPLUS), compatibility prospects are less certain. Apparat (NEWDOS), Galactic Software (LDOS) and MicroSystems Software (DOSPLUS) all say they are developing Model III versions of their Model I disk operating systems. The extent of compatibility between these Model I and Model III operating systems is yet to be demonstrated.

#### Conversion Utilities:

These do not provide the convenience of direct compatibility between the Model I and Model III but they appear to be the only near-term solution for TRSDOS-supported programs and data files. In addition to the Model III TRSDOS "CONVERT" utility, which transfers Model I TRSDOS programs and data files to a Model III TRSDOS diskette, we are aware of several other conversion utilities being developed by various software vendors. One of these, called MOVE 3-2-1, runs on a Percom DOUBLER-equipped TRS-80 Model I and transfers the files from a Model III TRSDOS diskette to a Model I double-density diskette. Contact Percom Sales or Customer Service for availability and price of these conversion utilities.

(tm) trademark of Percom Data Company, Inc.

\* trademark of Tandy Radio Shack Corporation which has no relationship to Percom Data Company.

+ trademark of Apparat Company.

†† trademark of Lobo Drives, International

‡ trademark of Virtual Technology, Inc.

\*\*\* HOW TO ORDER PARTS AND OPTIONAL ITEMS \*\*\*

HOW TO ORDER: Order by mail...we're as near as your mailbox... or order by phone.

TOLL-FREE PHONE ORDERS: To save you money and insure prompt service, we've installed a toll-free number: 1-800-527-1592 FOR PLACING ORDERS ONLY. In Texas, and for Customer Service, dial (214) 272-3421. We cannot transfer calls received on our toll-free number to other departments -- please help us serve you better by dialing the correct number.

PROMPT SERVICE: We ship the cheapest, fastest way. We use UPS up to 50 lbs. per item, 100 lbs. per shipment. We use truck-freight for large or heavy shipments. Transportation charges collected on delivery.

COD ORDERS: COD orders are accepted where possible.

OPEN ACCOUNT TERMS: Net 10 days to rated firms.

TEXAS SALES TAX: Texas law requires that we collect 5% sales tax on all shipments in Texas.

MINIMUM ORDERS: We will add a handling charge of \$2.00 to all orders totaling less than \$15.00.

DAMAGED SHIPMENTS: Have carrier note if received in damaged condition, then file claim. About concealed damage: contact carrier for inspection, then file claim. Save the shipping carton.

\*\*\* HOW TO RETURN A UNIT FOR REPAIR \*\*\*

You have done everything you know how to do. You have read and reread the instruction manual and technical memos but you still can't get the ^\$(&@ thing to work!

Then it is time to let us help. We have yet to find a sick unit that cannot be restored to full health and vigor.

There are a few things you can do to help us when you return a unit for repair.

1. Write or call for return authorization before returning any merchandise. RETURNS WITHOUT AUTHORIZATION WILL BE REFUSED.
2. When you return a unit for repair, enclose a complete description of the problem.

\*\*\* NOTE \*\*\*

Questions that do not relate to the reason the unit is being returned for repair must be sent in under separate cover.

PERCOM DOUBLER(tm)  
USERS MANUAL  
050-1060-001-B

3. OUT-OF-WARRANTY repairs are performed for a labor charge of \$30.00 plus parts and shipping. If we find that a unit is functioning properly as received and does not require any service, the CHECKOUT CHARGE is \$10.00 plus return shipping and insurance. Do not enclose any payment. The unit will be returned C.O.D. for authorized repairs and shipping.

4. When returning a unit for repair, pack it in a large carton with at least 3" of padding on all sides. We will not attempt to service any unit if there is shipping damage until the claim is settled (a real hassle). Ship prepaid by UPS or INSURED PARCEL POST to:

Percom Data Co.  
Service Dept.  
211 N. Kirby  
Garland, TX 75042

We try to turn most repairs around within one week.



PERCOM DATA COMPANY, INC.  
211 N. KIRBY GARLAND, TEXAS 75042  
(214) 272-3421